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APPLICATION NUMBER: *60/554,411*
FILING DATE: *March 19, 2004*
RELATED PCT APPLICATION NUMBER: *PCT/US05/09064*

Certified by

Jon W. Dudas

Under Secretary of Commerce
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PTO/SB/16 (05-03)
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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

Express Mail Label No.	

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Ansui	Xu	Carmel, IN
Brian	Dahlman	Carmel, IN

☒ *Additional inventors are being named on the 1 separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

HIGH FIBER, REDUCED EFFECTIVE CARBOHYDRATE CORN-BASED FOOD FORMULATIONS

CORRESPONDENCE ADDRESS

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification *Number of Pages* 19 ☐ CD(s), Number

☐ Drawing(s) *Number of Sheets* ☐ Other (specify)

☒ Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☐ Applicant claims small entity status. See 37 CFR 1.27.

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FILING FEE AMOUNT ($)

☒ The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 19-0733 — 160

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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

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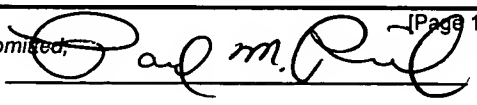
☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____.

Respectfully submitted,

SIGNATURE 

Date 3/19/04

REGISTRATION NO. *(if appropriate)* 43,446

TYPED or PRINTED NAME Paul M. Rivard

Docket Number: 005216.00041

TELEPHONE (202) 824-3000

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

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PROVISIONAL APPLICATION COVER SHEET

Additional Page

PTO/SB/16 (05-03)
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Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Docket Number	005216.00041

INVENTOR(S)/APPLICANT(S)

Given Name (first and middle [if any])	Family or Surname	Residence (City and either State or Foreign Country)
Michael	Van Houten	Carmel, IN
James	Pause	Avon, IN

Number 2 of 2

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FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 160.00

Complete if Known	
Application Number	TBD
Filing Date	March 19, 2004
First Named Inventor	Ansui Xu et al.
Examiner Name	TBD
Art Unit	TBD
Attorney Docket No.	005216.00041

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	160

SUBTOTAL (1) ($) 160

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

			Extra Claims		Fee from below		Fee Paid
Total Claims		- ** =	0	X		=	0
Independent Claims		- ** =	0	X		=	0
Multiple Dependent				X		=	0

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0

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FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive – unavoidable	
1453	1,330	2453	665	Petition to revive – unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17 (q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	
				Other fee (specify) ____	

*Reduced by Basic Filing Fee Paid SUBTOTAL (3) ($) 0

SUBMITTED BY Complete *(if applicable)*

Name (Print/Type)	Paul M. Rivard	*Registration No. (Attorney/Agent)*	43,446	*Telephone*	(202) 824-3000
Signature	Paul M Rivard			*Date*	March 19, 2004

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HIGH FIBER, REDUCED EFFECTIVE CARBOHYDRATE CORN-BASED FOOD FORMULATIONS

FIELD OF THE INVENTION

[01] The present invention is directed to high fiber, reduced effective carbohydrate corn-based food formulations.

DESCRIPTION OF RELATED ART

[02] There is a demand for reduced effective carbohydrate foods due to certain weight-control diet programs such as Atkins. There is also a demand for foods that contain a high level of total dietary fiber, e.g., for colon health and for potential cholesterol reducing benefits. A number of food manufacturers are marketing low carbohydrate tortilla chips. The formulations used typically contain (1) soy protein isolate and/or soy protein concentrate and (2) masa corn flour or corn meal or tapioca starch, and may additionally contain (3) rice flour, black beans, flax seeds, sesame seeds, or sunflower seeds; and/or (4) oat bran or soy fiber. For example, Frito-Lay has announced low carbohydrate tortilla chips made from corn and soy protein isolates.

[03] The following table summarizes several low carbohydrate tortilla chip products currently marketed in the U.S.

Product	Description	Ingredient Composition	Total Fat	Total Carb	Fiber	Sugar	Protein
Atkins Crunchers	Original, BBQ, Nacho, Sour Cream & Onion	Nacho: Soy protein concentrate, tapioca starch, sunflower oil, nacho seasoning (cheddar cheese powder [(partially hydrogenated soybean oil, whey, cheddar cheese (pasteurized cultured milk, salt, enzyme), maltodextrin, salt, nonfat dry milk, disodium phosphate, monosodium glutamate, citric acid, artificial colors (including F.D.&C. yellow #5 and F.D.&C. yellow #6), lactic acid)], buttermilk powder, salt, romano and parmesan cheese powders (partially skim milk, culture, salt, enzymes, disodium phosphate), tomato powder, monosodium glutamate, natural and artificial flavors, onion powder, lactic acid, garlic powder, citric acid, spice and not more than 2% vegetable oil and silicon dioxide added as processing aids), salt.	3 g	8 g	3 g	0 g	13 g
Carb Fit Tortilla Chips	Original only but make Carb Fit Twirls In seasoned varieties	Soy concentrate, corn, expeller pressed canola oil, and/or safflower oil, and/or sunflower oil, salt.	8 g	9 g	4 g	0 g	9 g
CarbSense	Original, Pico de Gallo, Nacho & Habanero	Nacho: Masa corn flour, soy protein concentrate (non-gmo), safflower oil, rice flour, black beans, oat bran, sesame seeds, flax seeds, seasonings (salt, cheese powder (milk, cheese cultures, salt, enzymes)), buttermilk, whey, onion, garlic, spices, tomato powder, natural flavors, sugar, extractives of paprika & turmeric, citric acid, lactic acid).	8 g	12 g	4 g	0 g	5 g
Keto Foods	Classic Corn, Cool Ranch, Nacho	Nacho: Soy protein isolate, soy-bean oil, soy protein concentrate, soy fiber, corn meal, seasoning (contains aged romano, cheddar & parmesan cheese, buttermilk, whey, salt, tomato powder, onion powder, garlic powder, natural flavor, citric acid, annatto, spice, lactic acid) and soy lecithin.	8 g	8 g	4 g	0 g	12 g
Genisoy Tortilla Chips	Lightly Salted, Zesty Habanero, Nacho Cheese and Fiesta Salsa	Masa corn flour, soy protein concentrate (identity preserved), expeller-pressed monounsaturated safflower oil or sunflower oil, black beans, rice flour, oat bran, sesame seeds, flax seeds, sunflower seeds, seasonings (salt, cheese powder [Cheddar and Romano cheese (milk, cheese cultures, salt and enzymes)], buttermilk, whey, onion, garlic, spices, tomato powder, natural flavors, sugar, extracts of paprika,& turmeric, citric acid and lactic acid.	8 g	12 g	4 g	0 g	5 g

[04] There remains a need for alternative reduced carbohydrate corn-based formulations for food products. It would be desirable to develop a formulation which does not require the presence of soy proteins, which can adversely affect food taste and texture and also are potential allergens. It would be particularly desirable to develop a formulation which also could be produced at lower cost than that associated with presently available formulations.

SUMMARY OF THE INVENTION

[05] According to one aspect, the present invention is directed to high fiber, reduced effective carbohydrate food formulations comprising:

a) about 10-80% masa corn flour;

b) about 10-60% ground corn bran; and

c) about 1-20% pre-gelatinized flour and/or pre-gelatinized starch.

[06] According to another aspect of the invention, high fiber, reduced effective carbohydrate formulations comprise:

a) about 10-80% masa corn flour;

b) about 10-60% ground corn bran;

c) about 1-20% pre-gelatinized flour and/or pre-gelatinized starch;

d) up to about 60% ground corn germ;

e) up to about 50% corn gluten meal; and

f) up to about 30% vital wheat gluten or wheat protein isolate.

[07] According to an alternative embodiment of the present invention, a reduced effective carbohydrate food formulation comprises:

a) about 10-80% masa corn flour;

b) about 10-60% ground corn germ; and

c) about 1-20% pre-gelatinized flour and/or pre-gelatinized starch.

[08] The formulations of the present invention are particularly suitable for preparing food products such as tortillas, tortilla chips, taco shells, corn based snacks, breakfast cereals, and the like. Preferred compositions of the present invention have improved machinability or handling properties compatible with equipment currently used to produce tortillas, tortilla chips and taco shells. These properties provide reduced propensity for sheeting and baking problems as a result of dough stiffness and stickiness normally associated with using soy protein isolate and soy protein concentrate.

[09] Compared with formulations containing soy protein isolates and soy protein concentrates, formulations of the present invention have the potential to yield food products exhibiting better sensory properties, for example without the beany taste and hard texture typically associated with products containing soy protein formulations. In addition, the formulations of the present invention potentially can be produced at lower cost than that associated with presently available formulations.

DETAILED DESCRIPTION OF THE INVENTION

[10] The present invention uses formulations containing corn bran and masa flour and a pre-gelatinized flour or pre-gelatinized starch, and optionally other ingredients such as corn germ, corn gluten meal and/or vital wheat gluten (VWG) or wheat protein isolate to make food products such as tortillas, tortilla chips, taco shells, corn-based snacks, breakfast cereals, and the like. Unless otherwise clear from the context, all percentages described herein refer to percent by weight based on the total dry weight of the formulation.

[11] The term "effective carbohydrates," as used herein, refers to the difference between total carbohydrates and total dietary fiber contents. Typically, effective carbohydrates include starch and sugars. Whether a formulation has "reduced effective carbohydrates," as used herein, can be determined by calculating the percent reduction in effective carbohydrates of the formulation as compared with "equivalent normal carbohydrates." Equivalent normal carbohydrates is a predicted effective carbohydrates percentage that would be present if a regular masa flour were used with the same fat and moisture in the food product. Preferred reduced effective carbohydrate formulations have an effective carbohydrate reduction of at least about 10%, preferably at least about 20%, more preferably at least about 30%, even more preferably at least about 40%, and yet even more preferably at least about 50%.

[12] Equivalent normal total dietary fiber refers to a predicted total dietary fiber percentage that would be present if a regular masa flour were used with the same fat and moisture in the food product. Total dietary fiber increase refers to the percent increase in total dietary

fiber of a given formulation as compared with the equivalent total dietary fiber. In the embodiments in which the formulation has increased total dietary fiber, the percent of total dietary fiber increase usually is at least about 10% and preferably at least about 20%, more preferably at least about 30%, even more preferably at least about 40%, and yet even more preferably at least about 50%. Some formulations of the present invention exhibit total dietary fiber increases of 100%, 200%, and even 300% or more.

[13] Preferred formulations of the present invention have the following composition:

a) 10-80%, preferably 15-60%, and more preferably 20-50% masa corn flour;

b) 10-60%, preferably 15-45%, and more preferably 25-40% ground corn bran, which may be prepared with or without cooking before grinding; and

c) 1-20%, preferably 3-15%, and more preferably 5-12% pre-gelatinized flour or pre-gelatinized starch;

d) 0-60%, preferably 15-40%, and more preferably 20-35% ground corn germ, which may be prepared with or without pretreatments of heating or toasting;

e) 0-50%, preferably 5-15%, corn gluten meal; and

f) 0-30%, preferably 5-20%, vital wheat gluten (VWG) or wheat protein isolate.

[14] Optionally, the formulation contains other components such as fibers from sources other than corn bran, protein products, other ground grains or legumes, and/or gums. Although soy protein may be present, preferred formulations of the invention are free or substantially free of soy protein.

[15] In an alternative embodiment of the invention, a reduced effective carbohydrate food formulation comprises:

a) about 10-80% masa corn flour;

b) about 10-60% ground corn germ; and

c) about 1-20% pre-gelatinized flour and/or pre-gelatinized starch.

[16] This formulation also is useful for preparing food products which have reduced effective carbohydrates, although which are less high in fiber. As in the previous embodiments, the formulation can be used to prepare food products such as tortillas, tortilla chips, taco shells, corn-based snacks, breakfast cereals, and the like. In addition, other components (as herein described) may be present in the formulation.

[17] Suitable masa flour is commercially available and/or can be readily prepared by persons of ordinary skill. The masa corn flour can be made with nixtamalization followed by drying, grinding and sizing. The masa flour alternatively can be made with grinding corn first, followed by cooking (with or without lime), drying and sizing, e.g., as described in U.S. Patent 6,068,873. The masa flour can have a wide range of granulations. Alternatively, nixtamalized dough or cooked masa can be used directly, e.g., without need to dry the dough into flour. In this case, suitable weights of nixtamalized dough or cooked masa to be used can be calculated based on percentages of masa flour described in this invention with moisture adjustments. For example, in a particular formulation, if 100 lbs. of masa flour is to be used and the masa flour has a moisture content of 10%, one can use 187.5 lbs. of a nixtamalized dough with 52% moisture while adjusting water

addition accordingly to make a suitable dough with the rest of ingredients as described in this invention. The following equation can be used to calculate the dough weight:

$$W_d = W_f (100 - M_f)/(100-M_d)$$

where W_d is weight of nixtamalized dough or cooked cook masa to be determined, W_f is weight of masa flour described in this invention, M_f is moisture percentage of masa flour, which is typically 9-14% (% is not used in the equation), and M_d is moisture of nixtamalized dough or cooked cook masa, which is typically 50-60% (% is not used in the equation).

[18] Corn bran can be processed using methods similar to those described in U.S. Patent 6,383,547, U.S. Patent 6,056,990 and U.S. Patent 6,610,349. The corn bran can also be made with grinding without cooking. The corn bran can be prepared either from a dry corn milling process or from a wet-milling process. U.S. Patent 6,383,547 to Delrue et al. discloses a process for preparing aspirated bran as a flour additive. U.S. Patent 6,056,990 to Delrue et al. describes milled cereal by-product which is an additive for flour and dough. U.S. Patent 6,610,349 to Delrue et al. discloses milled cereal by-product which is an additive for increasing total dietary fiber. Either ground bran, ground germ, or both can be cooked together with ground endosperm. Other variations are possible. For example, unground bran and intact germ can be cooked together with ground endosperm, followed by grinding.

[19] Pre-gelatinized flour can be made with cooking corn flour or a coarser corn meal such as soft meal or cones, followed by grinding and drying. Cooking can be accomplished with any type of suitable cooking methods such as steam cooking, drum cooking or extrusion cooking. A pre-gelatinized starch can be used instead of or in combination with the pre-gelatinized flour. Non-limiting examples of pre-gelatinized starch include corn starch, wheat starch, potato starch, rice starch, tapioca starch, barley starch, oat starch, rye starch, sorghum starch, sago starch, sweet potato starch, and pea starch. Alternatively, a pre-gelatinized flour of another grain from any source, including but not limited to a pre-gelatinized wheat flour, a pre-gelatinized oat flour, a pre-gelatinized barley flour, a pre-gelatinized rye flour, a pre-gelatinized rice flour, and a pre-gelatinized sorghum flour, can be used in place of or combined with pre-gelatinized corn flour.

[20] Ground corn germ can be made by a method similar to the process described in U.S. Patent 6,638,558 except for the need to be cooked with lime. Thus, the corn germ can be separated from corn endosperm in the dry milling process by a degerminator, followed by separation through aspirators, roll mills and sieves. The germ then can be ground in a hammer mill to a desirable granulation. The source of germ can be from a dry corn milling process or a wet corn milling process. Germ from other grains or legumes can also be used.

[21] Alternatively, germ (ground or intact), ground endosperm, and ground bran can be cooked together followed by drying and grinding, for example in accordance with the process described in U.S. Patent 6,068,873. Corn bran can be from a dry milling process

or a wet milling process. Corn bran can be ground without cooking. Germ can be from a dry milling process or a wet milling process.

[22] Granulations of all the ingredients can be varied without departing from the spirit or scope of the invention. It will be appreciated by persons skilled in the art that too coarse a granulation can cause sheeting problems on a conventional tortilla line but may be acceptable on other lines, such as extrusion. Various other ingredients can be added to affect texture, taste, or other characteristics of the formulation without departing from the spirit of scope of the invention.

[23] The compositions described herein are particularly useful for the preparation of tortillas, tortilla chips, taco shells or snack foods. These and other food products can be made in accordance with well-known processes, which form no part of the present invention.

Examples 1-9

Tortilla chips were prepared having the compositions shown in the following table.

Example	Masa Type	Masa Flour	Pre-gelatinized Corn Flour	Cooked and Ground Corn Bran	Ground Germ	Corn gluten meal	VWG
1	A	50%	5%	20%	20%	5%	
2	A	50%	5%	20%	20%		5%
3	A	41%	6%	27%	27%		
4	A	34%	7%	33%	21%		5%
5	A	17%	8%	33%	27%		15%
6	A	32%	7%	34%	22%		5%
7	A	29%	7%	37%	27%		
8	B	29%	7%	37%	27%		
9	C	29%	7%	37%	27%		

[24] All masa flour products were made by Cargill Dry Corn Ingredients. Masa type A is a medium-fine yellow masa flour with a granulation of 12% above US 20M and 55% below US60M. Masa type B is a fine white masa flour with a granulation of about 30% above 60M. Masa type C is a fine yellow masa flour with a granulation of about 30% above 60M. Pre-gelatinized corn flour was made with extrusion cooking and had a granulation of about 7% above 60M.

[25] Cooked and ground corn bran was made using a procedure similar to that described in U.S. Patents 6,056,990, 6,610,349 and 6,383,547 to Delrue et al. with some modifications. Bran separated from corn kernels using a degerminator and aspirators was soaked in water and heated to cook the bran without lime. The cooked bran was then dried in a flash dryer and ground in a micron grinder to a granulation of essentially 100% through 40M.

[26] Ground germ was made with a procedure containing steps of removing germ from kernels using a degerminator, aspiration cleaning, roll mill flattening, sifting for purification, and hammer mill grinding and sifting for sizing. The ground germ had a granulation of about 35% above 60M.

[27] Corn gluten meal is a product of the corn wet-milling industry and is commercially available. Vital wheat gluten is a product of the wheat wet-milling process and is commercially available, for example, from Cargill, Inc., Minneapolis, MN and Midwest Grain Products, Inc., Atchison, KS.

[28] The following table summarizes the processing and product properties of the tortilla chips. Water level is based on dry mix weight.

Example	Water Level	Dough	Sheeting	Baking	Chip Moisture (%)	Chip Fat (%)	Effective Carbs (%)	Equivalent Normal Carbs (%)	Effective Carbs Reduction (%)	Total Dietary Fiber (%)	Equiv. Total Dietary Fiber (%)	Total Dietary Fiber Increase
1	72%	Ok	Ok	Ok	3.11	26.8%	41.7	57.7	27.7%	16.3	5.7	186%
2	77%	Ok	Ok	Ok	3.47	23.0%	43.7	60.5	27.8%	17.1	6.0	185%
3	79%	Ok	Ok	Ok	2.92	30.4%	37.4	55.0	31.9%	19.6	5.4	263%
4	77%	Ok	Ok	Ok	3.84	25.1%	36.8	58.6	37.2%	23.8	5.8	310%
5	77%	Elastic	Harder	Ok	2.78	24.3%	30.5	59.9	49.0%	23.1	5.9	292%
6	79%	Ok	Ok	Ok	2.27	21.6%	38.4	62.3	38.4%	26.1	6.2	321%
7	79%	Slightly Sticky	Ok	Ok	1.50	37.6%	30.6	50.0	38.8%	21.4	5.0	328%
8	75%	Ok	Ok	Ok	2.47	37.7%	30.3	49.5	38.8%	21.2	4.9	333%
9	75%	Ok	Ok	Ok	2.62	33.3%	32.4	52.9	38.8%	22.6	5.2	335%

[29] In the preceding table and the table below, equivalent normal carbs (%) is the predicted effective carbohydrates percentage in the product if a regular masa flour were used in place of the stated formula with the same fat and moisture in the chips. The prediction was based on the composition of the typical masa flour. Effective carbs reduction (%) is percent reduction in effective carbohydrates of the stated examples as compared with the equivalent normal carbs. Similarly, equivalent total fiber (%) is the predicted effective total dietary fiber percentage that would be present if a regular masa flour were used with the same fat and moisture in the food product. Total dietary fiber increase is the percent increase in total dietary fiber of the stated examples as compared with the equivalent total dietary fiber.

[30] The dry ingredients were pre-blended for 1-2 minutes and mixed for about 5 minutes after adding water. The dough was sheeted into a triangle shape and baked in a gas oven at about 500-800°F for about 37 seconds. The baked chips were cooled for about 10 seconds to 4 minutes and then fried in soybean oil or canola oil at about 350°F for 30-60 seconds.

[31] All formulations had good processing properties during sheeting and baking. The resultant chips had acceptable color and appearance and eating characteristics, including taste and texture.

Examples 10-16

[32] Taco shells were prepared with a procedure similar to that used for making tortilla chips. In fact, the formulations for taco shells in the table below can also be used for making tortillas and tortilla chips. Tortillas can be made in the same manner except that there is no need for frying. Tortilla chips can be made in the same manner except that the dough or the tortillas can be cut into the desirable shape and size for typical tortilla chips and tortilla chips are fried to have a lower moisture content than taco shells.

[33] Taco shells need to be folded after baking into a frying mold to be fried into the taco shell shape. One challenge for the formulations is to allow sufficient flexibility in baked tortillas so that folding can be accomplished without breakage or cracking of the tortillas.

Example	Masa Type	Masa Flour	Pre-gelatinized Corn Flour	Cooked and Ground Corn Bran	Ground Germ	Toasted Ground Germ	Corn gluten meal	VWG	Guar Gum
10	A	55%	10%	15%		10%	10%		
11	A	42%	10%	15%	15%		10%	8%	
12	D	50%	5%	20%	20%		5%		
13	A	32%	7%	34%	27%				
14	E	28%	10%	34%	22%			5%	
15	E	31.5%	8%	34%	22%			5%	0.5%
16	E	29%	10%	41%	15%			5%	

[34] Masa type D is a fine white masa flour with about 25% above 60M. Masa type E is a coarse yellow masa flour with a granulation of about 25% above 20M and about 30% through 60M. Toasted ground germ was obtained from Quali Tech, Inc., Chaska, MN. Guar Gum was obtained from TIC Gums, Inc., Belcamp, MD. The following table summarizes the processing and product properties of the taco shells.

Ex.	Water Level	Dough	Sheeting	Baking	Taco Moisture (%)	Taco Fat (%)	Effective Carbs (%)	Equivalent Normal Carbs (%)	Effective Carbs Reduction	Total Dietary Fiber (%)	Eq Total Dietary Fiber (%)	Total Dietary Fiber Increase
10	77%	Ok	Slightly sticky	Ok	4.1	35.6	38.4	50.3	23.6%	11.1	5.0	122%
11	65%	Firm	Thick	Floury appearance	4.23	38.8	32.0	47.7	33.0%	10.7	4.7	128%
12	81%	Good	Good	Needed to lower Temp. to be flexible	6.11	21.5	43.4	60.0	27.7%	17.0	5.9	188%
13	79%	Good	Ok	Ok	3.16	28.4	35.7	56.4	36.7%	22.9	5.6	309%
14	75%	Ok	Ok	Ok	4.89	26.9	34.8	56.6	38.4%	22.0	5.6	293%
15	79%	Firm	Fair	Ok	2.75	27.4	35.1	57.5	39.0%	22.6	5.7	296%
16	79%	Ok	Ok, Slower	Ok	2.32	25.5	35.9	59.2	39.5%	24.9	5.9	322%

[35] The dry ingredients were pre-blended for 1-2 minutes and mixed for about 5 minutes after adding water. The dough was sheeted into a round shape with a diameter of about 5-6 inches and baked in a gas oven at about 500-800°F for about 37 seconds. The baked tortillas were cooled for about 10 seconds and then fried after being placed in a mold, in soybean oil or canola oil at about 350°F for 30-60 seconds.

[36] The formulations had acceptable processing properties in terms of sheeting, baking and folding. The formulations produced acceptable taco shells with good eating characteristics, acceptable color and appearance and fair sturdiness.

[37] While particular embodiments of the present invention have been described and illustrated, it should be understood that the invention is not limited thereto since modifications may be made by persons skilled in the art. The present application contemplates any and all modifications that fall within the spirit and scope of the underlying invention disclosed and claimed herein.

WHAT IS CLAIMED IS:

1. A high fiber, reduced effective carbohydrate food formulation comprising:

a) about 10-80% masa corn flour;

b) about 10-60% ground corn bran; and

c) about 1-20% of pre-gelatinized flour, pre-gelatinized starch, or both.

2. The formulation of claim 1 further comprising:

d) up to about 60% ground corn germ;

e) up to about 50% corn gluten meal; and

f) up to about 30% vital wheat gluten or wheat protein isolate.

3. The formulation of claim 1 which comprises:

a) about 15-60% masa corn flour;

b) about 15-45% ground corn bran;

c) about 3-15% of pre-gelatinized flour, pre-gelatinized starch, or both;

d) about 15-40% ground corn germ;

e) about 5-15%, corn gluten meal; and

f) about 5-20% vital wheat gluten or wheat protein isolate.

4. Tortillas comprising the formulation of claim 1.

5. Tortilla chips comprising the formulation of claim 1.

6. Taco shells comprising the formulation of claim 1.

7. A corn based snack comprising the formulation of claim 1.

8. Breakfast cereal comprising the formulation of claim 1.

9. The formulation of claim 3 which comprises:

   a) about 20-50% masa corn flour;

   b) about 25-40% ground corn bran;

   c) about 5-12% of pre-gelatinized flour, pre-gelatinized starch, or both;

   d) about 20-35% ground corn germ;

   e) about 5-15% corn gluten meal; and

   f) about 5-20% vital wheat gluten or wheat protein isolate.

10. Tortillas comprising the formulation of claim 9.

11. Tortilla chips comprising the formulation of claim 9.

12. Taco shells comprising the formulation of claim 9.

13. A corn based snack comprising the formulation of claim 9.

14. Breakfast cereal comprising the formulation of claim 9.

15. A high fiber, reduced effective carbohydrate food formulation comprising:

a) about 10-80% masa corn flour;

b) about 10-60% ground corn germ; and

c) about 1-20% pre-gelatinized flour and/or pre-gelatinized starch.

16. Tortillas comprising the formulation of claim 15.

17. Tortilla chips comprising the formulation of claim 15.

18. Taco shells comprising the formulation of claim 15.

19. A corn based snack comprising the formulation of claim 15.

20. Breakfast cereal comprising the formulation of claim 15.

ABSTRACT OF THE DISCLOSURE

High fiber, reduced effective carbohydrate formulations useful for preparing food products such as tortillas, tortilla chips, taco shells, corn based snacks, breakfast cereal, and the like comprise about 10-80% masa corn flour; about 10-60% ground corn bran; about 1-20% pre-gelatinized flour and/or pre-gelatinized starch; about 0-60% ground corn germ; about 0-50% corn gluten meal; and about 0-30% vital wheat gluten or wheat protein isolate.

Application Data Sheet

Application Information

Application number:	
Filing Date:	
Application Type:	Provisional
Subject Matter:	Utility
Suggested classification:	
Suggested Group Art Unit:	
CD-ROM or CD-R?:	None
Number of CD disks:	
Number of copies of CDs:	
Sequence submission?:	
Computer Readable Form (CRF)?:	
Number of copies of CRF:	
Title:	HIGH FIBER, REDUCED EFFECTIVE CARBOHYDRATE CORN-BASED FOOD FORMULATIONS
Attorney Docket Number:	005216.00041
Request for Early Publication?:	NO
Request for Non-Publication?:	NO
Suggested Drawing Figure:	
Total Drawing Sheets:	
Small Entity?:	NO
Latin name:	
Variety denomination name:	
Petition included?:	NO
Petition Type:	
Licensed US Govt. Agency:	
Contract or Grant Numbers:	

Secrecy Order in Parent Appl.?:	NO

Applicant Information

Applicant Authority Type:	Inventor
Primary Citizenship Country:	
Status:	Full Capacity
Given Name:	Ansui
Middle Name:	
Family Name:	Xu
Name Suffix:	
City of Residence:	Carmel
State or Province of Residence:	IN
Country of Residence:	USA
Street of mailing address:	
City of mailing address:	Carmel
State or Province of mailing address:	IN
Country of mailing address:	USA
Postal or Zip Code of mailing address:	

Applicant Authority Type:	Inventor
Primary Citizenship Country:	
Status:	Full Capacity
Given Name:	Brian
Middle Name:	
Family Name:	Dahlman
Name Suffix:	
City of Residence:	Carmel
State or Province of Residence:	IN
Country of Residence:	USA
Street of mailing address:	

City of mailing address:	Carmel
State or Province of mailing address:	IN
Country of mailing address:	USA
Postal or Zip Code of mailing address:	

Applicant Authority Type:	Inventor
Primary Citizenship Country:	
Status:	Full Capacity
Given Name:	Michael
Middle Name:	
Family Name:	Van Houten
Name Suffix:	
City of Residence:	Carmel
State or Province of Residence:	IN
Country of Residence:	USA
Street of mailing address:	
City of mailing address:	Carmel
State or Province of mailing address:	IN
Country of mailing address:	USA
Postal or Zip Code of mailing address:	

Applicant Authority Type:	Inventor
Primary Citizenship Country:	
Status:	Full Capacity
Given Name:	James
Middle Name:	
Family Name:	Pause
Name Suffix:	
City of Residence:	Avon

State or Province of Residence: IN
Country of Residence: USA
Street of mailing address:

City of mailing address: Avon
State or Province of mailing address: IN
Country of mailing address: USA
Postal or Zip Code of mailing address:

Correspondence Information

Correspondence Customer Number: 22907

Representative Information

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Domestic Priority Information

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Country:	Application number:	Filing Date:	Priority Claimed:

Assignee Information

Assignee name: Cargill, Inc.

Street of mailing address:	15407 McGinty Road, West
City of mailing address:	Wayzata
State or Province of mailing address:	MN
Country of mailing address::	USA
Postal or Zip Code of mailing address:	55391